NASA Activities

National
Aeronautics and
Space
Administration

Vol. 8, No. 8
August 1977

Cover

Perfect First Free Flight for Shuttle Orbiter—Floating to Earth like the world's most overweight butterfly from an altitude of some 8,200 meters, the 64-metric-ton *Enterprise* glided to a flawless landing after being released for the first time from its Boeing 747 carrier. The climactic maiden flight took place the morning of Aug. 12, when the orbiter's wheels touched down on the seven-mile-long runway built at the edge of the dry lakebeds in the Mohave Desert. Four chase planes accompanied the tethered pair during its hour-long flight over NASA's Dryden Flight Research Center at Edwards Air Force Base. The *Enterprise* landed a little more than five minutes after the explosive bolts that secured the orbiter to the Boeing 747 were fired, thus releasing the smaller craft which came in, without motorized help, traveling at speeds as high as 480 km/h. Some 70,000 observers were on hand at the desert site to watch the historic event.

Correction—A reader has pointed out that the claim made in *Activities* for June (p. 10-11) to the effect that the Bell G-14 was the first vectored-thrust jet VTOL is incorrect. The Ryan X-13 was the first vectored-thrust VTOL.

NASA Activities is published monthly by the National Aeronautics and Space Administration for the information of the Agency's employees.

Contributions and recommendations are solicited from headquarters and field centers, and should be addressed to the Office of Public Affairs, Code FP, Washington, D.C. 20546.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Annual subscription rate: $11.55 domestic; $14.45 foreign. Price per single copy: $1.00 domestic, $1.25 foreign. Back issues not available.

Ann Weeks
Editor, Code FP
NASA Headquarters, FOB 6
Washington, D.C. 20546
(Phone: 202 755-3705)

Table of Contents

Letter from Washington 3
Balloon Drop Test a Success 4
First Japanese Weather Satellite Launched ... 5
Lewis Staffer Heads Women's Club 6
Parachute Test Program Under Study 6
Stein Wins Fellowship 7
KSC Honors Small Business Firms 8
Marshall Selected by ERDA to Monitor Solar Energy Products 8
New Deputy Director at KSC 9
Test Facility for Shuttle Completed 10
Pioneer 11 Crossed Jupiter's Orbit Again 10
Viking Biology Instruments Turned Off 10
A Man for the Ages 12
Goddard Education Personnel Win Praise 15
New Autopilot for High-flying, Super-fast Planes 15
Two Spacelab Simulations Completed at NASA Centers 15
Sounding Rockets Now Have "Person-in-Loop" System 16
Planetary Evolution May Be in View 17
Two Tons 12 Miles High 18
Marshall Man Receives Sloan Fellowship 19
Visual Communications Seminar 19
NASA Author Levy Elected to National Office. 20
Groo Leaves NASA 20
NASA Employee Is Regional Director of IMAGE 20
Did You Know? 21
Contractor News 21
Patents for Inventions 22
Launches for 1977 23
Another Dividend from Air and Space 24

Letter from Washington

Dear Colleagues:

Over the years much has been written on this page about the Space Transportation System—and many more words will follow in this space on the same subject because for the recent past, for the present and for the immediate future, the Shuttle is the project which uses the highest percentage of our effort and our resources.

In mid-August the Shuttle glided silently past the most important milestone in its development except for its still-to-come actual maiden round-trip voyage into space. With a precision and professionalism we learned to expect from Apollo, the orbiter separated for the first time from its carrier aircraft, executed its prescribed approach and touched down flawlessly on the lakebed runway at Edwards Air Force Base.

For Fred Haise and Gordon Fullerton at the orbiter controls, for the 747 crew, the chase pilots, scores of ground controllers, communicators and monitors, at the Dryden center, it must have seemed very familiar, almost routine, after the endless hours of practicing every aspect of that short, unpowered flight in ground and airborne simulators. But this one was different. This was like the moment of truth for the shipboard navigator who waits for the predicted lighthouse to break the horizon after an ocean crossing, or the airline pilot anticipating the runway lights of his destination after a long instrument approach in rain and fog. This was where everything would pay off—or would not.

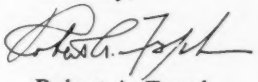
It did. And the space program moves on from there.

In my view that program has three essential elements: Earth observation and the application of the knowledge gained for the benefit of humanity; scientific exploration of the universe to determine the place of Earth and Man in the scheme of things; and investigation of the Sun-Earth relationships so basic to the whole bio-system in which we evolved and in which we live.

The Space Transportation System is essential to all three elements, freeing us from the weight and cube restrictions of expendable launch vehicles, from the necessity to design for extreme and long-term reliability, opening the door to the assembly of large structures in space, to space processing and manufacturing and to numerous other opportunities not even imaginable. And when we have achieved a solid base of practical experience with the Shuttle we will begin to see our way more clearly to such potentially useful projects as satellite solar power stations and permanent habitations in space.

In other words, the use of space for the advancement and betterment of man depends on the success of the Space Shuttle, a success which moved measurably closer with the events of mid-August 1977 over the Mojave Desert of California. To all concerned, congratulations and well done.

Sincerely,



Robert A. Frosch

Balloon Drop Test a Success

A critical segment of the entry into the atmosphere of Venus of the main probe for NASA's 1978 Pioneer-Venus mission was successfully tested in late May by a drop of the probe from an Air Force balloon, 27 kilometers (17 miles) above the White Sands Missile Range, N.M. The main probe is designed to carry instruments for the detailed measurement of Venus' atmosphere. The recent test duplicated flight events just before descent of an instrument into the planet's dense, hot lower atmosphere.

"All test objectives appear to have been met, and the probe successfully qualified for Venus entry," said NASA's probe system manager Simon C. Sommer, at the Ames Research Center.

Demonstrated were: deployment of the probe parachute; separation of its atmosphere entry heat shield; and, after nine minutes of parachute descent, separation of the parachute for simulated flight of the probe instrument vessel down to Venus' searing surface.

Objective of the Pioneer-Venus mission is to characterize Venus' relatively simple atmosphere and weather. Scientists believe this knowledge will help them to understand Earth's complex weather patterns.

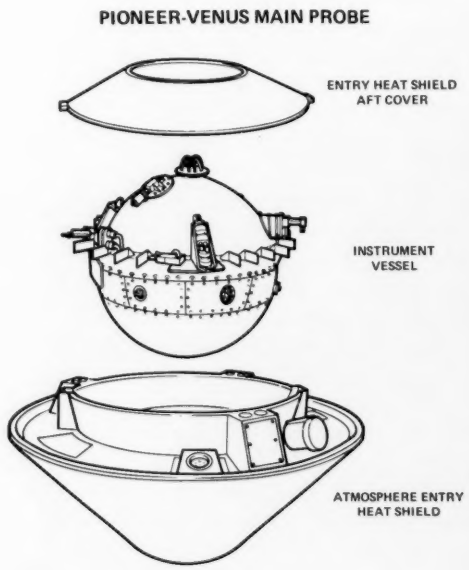
Two coordinated Pioneer-Venus spacecraft will be launched to the cloud-shrouded planet in 1978, one in May and one in August. Both will arrive in December 1978. The orbiter spacecraft will circle Venus for a year or more. The multiprobe spacecraft carries the main probe and three smaller probes, all four of which will enter the atmosphere on arrival, some 8,000 km (5,000 mi.) apart, and reach the surface in an hour. The main probe and one small probe will enter on the planet's day side, the two others on the night side. All four will measure the atmosphere from top to bottom.

The Pioneer Venus project is managed by the Ames center. The drop test was carried out by the U.S. Air Force Geophysics Laboratory (AFGL) using a 90,000-cubic-meter (3-million-cubic-foot), high-altitude plastic balloon.

After the balloon was launched from Holloman Air Force Base, N.M., it rose to 28,500 m (95,000 ft.), and floated at varying altitudes for eight hours until wind conditions allowed a drop from 30,500 m (28,000 ft.) over White Sands. White Sands range personnel tracked the entering probe and recovered first the probe pressure vessel and parachute, later the aeroshell and aft cover.

For entry into the planet's atmosphere, the Pioneer main probe will separate from the multiprobe spacecraft 12 million km (7.5 million mi.) out from Venus and enter the atmosphere at 40,950 km/h (26,000 mph). Atmospheric drag will slow the probe to 720 km/h (450 mph) at 67 km (42 mi.) above the surface. At that point, the parachute opens, slowing the probe in 17 minutes to 36 km/h (22 mph), and the heat shield is jettisoned. The parachute then separates.

With no chute, the probe instrument vessel will cover the remaining 47 km (29 mi.) to the surface in 40 minutes, first speeding up to 216 km/h (134 mph), and then slowing because of rapidly increasing atmosphere density until impact at 43 km/h (27 mph). The fast final descent is needed so that the hot surface can be reached before the heat of the



Versatile Space Vehicle—A drawing of the Pioneer-Venus multiprobe spacecraft being built for intensive study of the Venusian atmosphere, to begin in 1978. The program will be accomplished through use of two separately launched spacecraft—a bus carrying four atmosphere probes (shown in photo) and an orbiter. The large probe will descend through Venus's atmosphere by parachute to an altitude of about 44 kilometers (26 miles), where it will jettison the parachute and fall to the planet's surface. The small probes, each carrying five pounds of instrumentation, will be targeted to sample the weather at locations 8,000 km (5,000 miles) apart. Their mission ends when they land on the surface, about an hour after entry. The Ames center is in charge of the multiprobe development program.

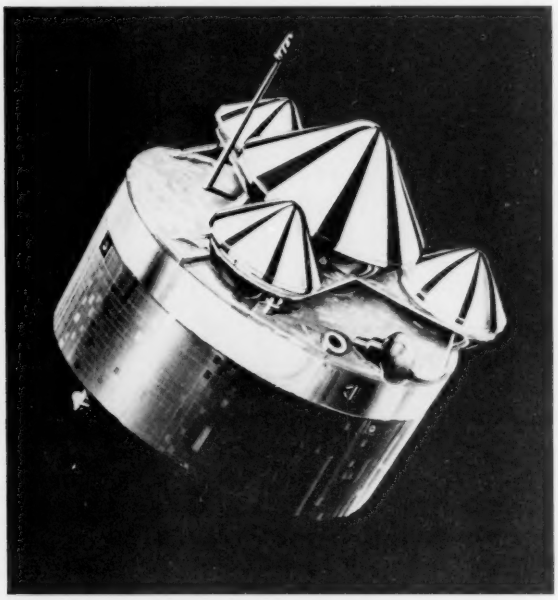
atmosphere destroys the instruments. Temperature at the surface is more than 500 degrees C (920 degrees F), or hotter than the melting point of zinc. Pressure is 100 times that on Earth.

The test took place far closer to Earth than the actual entry point above Venus. At the test altitude of 15 km (10 mi.) above Earth, the atmosphere temperature, density and probe velocity were very nearly the same as that expected on Venus at 67 km (42 mi.) above the surface, the point of actual parachute deployment.

The instrumented vessel contained special equipment to record system performance. Range radar, movie cameras on the balloon platform, others looking back from the instrument vessel, as well as telescopic still and movie cameras on the ground, recorded the test.

Lt. Mike Wilson, AFGL, is project officer for the balloon system. AFGL has had long experience with high altitude balloon tests, most recently with the Viking lander for Mars.

The Pioneer spacecraft are built by Hughes Aircraft Co., Culver City, Calif. Prime contractor. General Electric Co., Philadelphia, makes the probe entry system.



Pioneer-Venus Multiprobe Spacecraft—How an artist sees the multiprobe spacecraft being built for intensive study of the Venus atmosphere. The program, to begin in 1978, will be carried out by two spacecraft—a bus carrying four atmosphere probes (above) and an orbiter. The multiprobe vehicle will carry one large atmospheric probe and three identical small probes.

First Japanese Weather Satellite Launched

An American rocket, NASA's Delta 2914, launched the Japanese government's first meteorological satellite into synchronous orbit from Cape Canaveral on July 14. The Geosynchronous Meteorological Satellite, weighing 281 kilograms (620 pounds), represents a major scientific attempt to improve weather predictions over millions of square miles in the western Pacific Ocean. The GMS has an estimated lifetime of five years.

The spacecraft comes under a satellite program directed by the National Space Development Agency of Japan. The Delta launch vehicle project is managed for NASA's Office of Space Flight by the Goddard Space Flight Center.

From its "meteorological arena" 35,600 kilometers (22,250 miles) in space, GMS can identify, pinpoint and photograph every major weather pattern from Hawaii to Pakistan. The satellite's "cameras" take cloud cover photos of about one-third of the world every 30 minutes, 24 hours a day, to help alert meteorologists to discover or track potentially perilous storms over the Pacific. The satellite is positioned over the equator directly south of Tokyo at 140 degrees East longitude.

Mission objectives of the GMS are to observe cataclysmic events such as hurricanes, typhoons and other weather phenomena, and day and night regional weather. GMS also will relay meteorological observations from surface collection points (ships, buoys and weather stations) to the central processing center in Japan, and it will transmit processed images for facsimile reproduction at distribution points in the western Pacific area.

Aboard GMS is a visible infrared spin-scan radiometer, capable of making accurate pictures of the Earth's cloud cover in daylight and in total darkness. The images, which are transmitted to Earth once every 30 minutes, enable meteorologists to identify, monitor and track severe storms, heavy rainfall or cloudbursts, floods and typhoons.

The spacecraft also carries a space environment device to monitor energetic particle activity emanated by the Sun. Extreme solar activity can affect Earth communications. The instrument monitors solar protons, alpha particles and solar electrons.

The Japanese ground station at Okinawa and NASA's Space Tracking and Data Network station at Rosman, N.C., provided continual transfer orbit monitoring of the spacecraft. The ground station at

Masuda, Japan, and other stations in the NASA network (Orroral Valley, Australia and Santiago, Chile) provided backup capability in monitoring the transfer orbit. All control and monitoring functions of the orbiting satellite will be performed from the GMS mission control center at the Hughes Aircraft Company, El Segundo, Calif.

The cylindrically-shaped weather satellite is the first of a number of "weather watchers" to be launched by several countries in an attempt to improve global weather predictions for extended periods. This international weather satellite program is a major part of the Global Atmospheric Research Project, sponsored by the International Council of Scientific Unions and the World Meteorological Organization. The European Space Agency, which also participates in the program, comprises Belgium, Denmark, France, Italy, Netherlands, Spain, Sweden, Switzerland, West Germany, the United Kingdom and Ireland.

Under the GARP Program, five geostationary meteorological satellites (two from the U.S., one each from Japan, the Soviet Union and the European Space Agency) will be placed in orbit. Additionally, the U.S. and the Soviet Union plan to launch two satellites apiece into polar orbit to collect data on meteorology, weather and solar activity. About 145 countries also will make contributions to the worldwide weather effort by taking daily surface and atmospheric measurements in their respective areas.

All GARP data are sent to central data centers in Moscow and Washington, D.C. Current planning calls for the program to be in full operation by December 1978.

The launching Delta rocket is managed for NASA's Office of Space Flight by the Goddard Space Flight Center. NASA's Kennedy Space Center's expendable launch vehicles division is responsible to Goddard for management of launch operations.

GMS was designed, developed and manufactured by Hughes Aircraft Co. under subcontract to the Nippon Electric Co., Ltd. of Japan. Hughes also developed the satellite's camera system. The monitor was designed and built by Nippon Electric Co. Prime contractor for the Delta launch vehicle is McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

The U.S. is reimbursed by the Japanese Government for costs associated with providing Delta launch support.

Lewis Staffer Heads Women's Club

Theresa A. Horvath was installed as director of district 5 of the Ohio Federation of Business and Professional Women's Clubs at the 57th Annual BPW State Convention held in Cleveland May 21. Horvath, Lewis' Federal Women's Coordinator and staff member of the Lewis Equal Employment Opportunity Office, will direct and coordinate the activities of all 12 BPW clubs in Cuyahoga County, including Cleveland, during the 1977-78 club year.

A charter member of the NASA-Lewis BPW Club, Horvath was its first president. Later she served another two-year term as president (1974-76). She has held other offices and chaired several committees in the Lewis club. In 1971 the Lewis BPW club members voted her "Woman of the Year."

At the district level, Horvath has served on numerous panels and as district legislative representative for four years. She headed the hospitality committee at the May BPW state convention in Cleveland.

At Lewis, she is a member of the board of directors of the Lewis performing arts theatre, and the speakers' bureau. She was appointed manager of the Lewis Combined Federal Campaign in 1974, the first woman to serve in that post.

Parachute Test Program Under Study

The parachutes that will be used in the future to recover the reusable Space Shuttle solid rocket boosters were drop-tested by NASA's Dryden Flight Research Center personnel last June over the National Parachute Test Range at El Centro, Calif.

The Space Shuttle, the primary carrier vehicle for America's Space Transportation System of the 1980's being developed by NASA, will emphasize the reusability of most of its components—the orbiter, main engines and solid rocket boosters.

When the Shuttle flies, two solid rocket boosters will be used for each launch. They will fire, together with the Orbiter's three main engines, to boost the vehicle from the launch pad to an altitude of about 43.5 kilometers (27 miles). The solid rocket boosters, which will be the largest ever flown, will

then be jettisoned at burnout for descent via parachute into the ocean about 225 km (140 mi.) downrange. The boosters will be recovered, towed back to shore, refurbished, refueled and prepared for reuse.

The Dryden center provides the B-52 aircraft, the flight and maintenance crews.

NASA's Marshall center is responsible for development of the solid rocket boosters to be used to help launch the Space Shuttle. The Martin Marietta Corp. of Denver, Colorado, is contracted to MSFC for development of the recovery parachute system. Both organizations are charged with evaluation of the system.

The drop test program consists of a series of air drops using full-scale, flight-type parachutes to provide the necessary data for evaluating designs, deployment processes, parachute performance and parachute structural integrity. Two configurations of drop test vehicles to be released from the B-52 carrier aircraft will be used to provide various combinations of limit and overload conditions for the drogue and main parachutes at reefed and full-open canopy shapes. The test series will consist of drogue and main parachute tests, most of which will use only one main parachute, but testing of the cluster of three main parachutes—the actual flight configuration—also will be carried out.

The simulated booster was defined by the Marshall Space Flight Center to be aerodynamically compatible with the B-52 carrier aircraft. It weights slightly less than 22,680 kilograms (50,000 pounds), about one-third the weight of an empty or burned-out booster.

Parachute Recovery Tests—The drop test vehicle used to test the parachutes that will recover the reusable Space Shuttle solid rocket boosters is maneuvered under the wing of a B-52 at the Dryden center.

Stein Wins Fellowship

Bland A. Stein, assistant head of the materials research branch, materials division at the Langley Research Center, recently was selected to participate in the 1977-78 Education for Public Management Program at the University of Virginia. The Civil Service Commission fellowship is offered for one academic year at one of eight universities.

The mid-career program at the University of Virginia is designed for executives who have demonstrated strong performance in government service, to prepare themselves for higher administrative and policy leadership positions. The program seeks to broaden the executive's understanding of major problems facing government and society, deepen an individual's knowledge of our political system and its policy-making processes, develop self-awareness and sensitivity to human values, and give special understanding of the role of the higher civil servant.

A member of the Langley staff since 1956, Bland Stein is nationally recognized for his work in the field of aerospace environmental effects on materials. He organized and brought to successful completion a large program to develop metallic heat-shield technology for hypersonic vehicles. This activity received a NASA Group Achievement Award in 1976. In 1973, he received a Group Achievement Award for performing and directing more than 100 analyses of failures for NASA and outside organizations.

He is an Associate Fellow of the American Institute of Aeronautics and Astronautics; a member of the AIAA Technical Committee on Materials; chairman of the aerospace panel serving the Joint Committee of the American Society for Testing and Materials, the American Society of Mechanical Engineers, and the Metals Property Council. He also serves on the NASA OAST space technology working group on materials; on the Langley research advisory committee; and as a faculty member of George Washington University.

Stein's early education was in New York City public schools. He received a bachelor of science degree in mechanical engineering in 1956 from City College of New York and a master of science degree in

metallurgical engineering in 1964 from Virginia Polytechnic Institute and State University. He did graduate work in materials engineering at North Carolina State University in 1968.

KSC Honors Small Business Firms

Since fiscal year 1970, the Kennedy Space Center has awarded more than $100 million in contracts to small business firms. During late May, the center joined other NASA centers and other government agencies for Small Business Week, honoring the country's more than nine million small business firms.

Jack Dryer, industry advisor and small business specialist of the KSC Procurement Office, reported that KSC issued $22 million and 11,717 awards and contracts to small businesses in fiscal year 1976. About $11 million in awards went to Florida-based firms, with many of the contracts being granted to local businesses. At the midway point of this fiscal year, KSC has awarded over $21 million to small business firms.

KSC has also been a leading NASA center in the granting of contracts to minority owned firms. Dryer said that in 1976, the spaceport awarded $2.6 million to minority firms, and over $2.25 million this year.

Another provision was initiated this year by KSC to aid minority business—for all KSC construction contracts of more than $500,000, the prime contractor must subcontract at least 20 percent of its total subcontractor amount to minority firms.

Small businesses currently under KSC operate the Center's technical and research library, provide janitorial services, furnish printing and reproduction services and handle the mail and distribution duties. KSC also maintains a number of small business firm construction contracts.

Marshall Selected by ERDA To Monitor Solar Energy Projects

Twenty-seven new solar heating and cooling systems to be installed by ERDA in 15 states have been assigned to the Marshall Space Flight Center for the monitoring of technical design and construction.

The center presently is monitoring 32 other commercial demonstration projects that were selected by ERDA in April 1976, in the first of a series. A third solicitation for proposals will be issued by ERDA this summer.

One of the projects to be monitored is a solar heating and hot water system to be installed at the Senior Citizen Center in Huntsville, Ala. Another is a heating and hot water system for a shower and change facility at Listerhill, Ala., for the Product Development division of Reynolds Metals Co., Richmond, Va. Two of the Marshall projects are in Tennessee, three are in Florida and one is in Georgia. Other states having one or more of the projects assigned to Marshall are Indiana, Kansas, Maryland, Missouri, New Jersey, North Carolina, Ohio, Texas, Virginia and West Virginia.

Government funds will be provided on a cost-sharing basis only for the solar portions of the projects. The Marshall center has begun the negotiation of cooperative agreements for ERDA with the proposers whose projects were chosen for monitoring. According to Dr. Henry H. Marvin, director of ERDA's Division of Solar Energy, cooperative agreements for the 27—plus an additional 53 solar systems—are expected to be signed within about three months.

Dr. Marvin noted that: "As was true of the first cycle of the demonstration program, small business participation in these awards is at a high level. More than 50 percent of the awards will be made to teams offering solar energy systems supplied by small business, and more than 90 percent of the funds will go to projects with substantial small business participation."

Among the new Marshall center projects are:

- **Florida:** In a hospital maintenance building at Boca Raton, a heating, cooling and hot water system; in a medical clinic and sports complex at Brandon, heating, cooling and hot water; and at the Florida Solar Energy Center, Cape Canaveral, an electronic data processing office, heating and cooling.
- **Georgia:** In an office building for the North Georgia Area Planning and Development Commission, Delton, heating, cooling and hot water.
- **Indiana:** In a school gymnasium for the Clarksville Community School Corp., Clarksville, heating.
- **Kansas:** In a school building for the Board of Education in Gypsum, heating and hot water; in medical offices in Wichita, heating; in an office and warehouse building in Kansas City, heating; and in a detached bank facility in Topeka, heating, cooling and hot water.
- **Maryland:** In two campus buildings for the Montgomery Community Center in Germantown, heating and hot water; in a senior citizen recreation center in Annapolis, heating, cooling and hot water;

Another Energy Saver—A heating and hot water system in a new office building in Huntsville, Ala., will be supported by solar energy received through solar collectors. The system was installed under the supervision of NASA's Marshall center, which is monitoring many such installations for ERDA.

and in a fire house in Baltimore, heating, cooling and hot water.

- **Missouri:** In a visitor's center for Stephens College in Columbia, heating; and in an office building in St. Louis, heating and hot water.
- **New Jersey:** In a hotel in Cherry Hill, heating and hot water; and in a restaurant in Long Beach, heating, cooling and hot water.
- **North Carolina:** In an office and retail building in Chapel Hill, heating, cooling and hot water.
- **Ohio:** In an office building in Columbus, heating, cooling and hot water; and in an educational and administration building at the Columbus Technical Institute, heating and cooling.
- **Tennessee:** In an office building in Nashville, heating and hot water; the same in a soft drink bottling plant in Jackson.
- **Texas:** In an office building in Dallas, heating and hot water; in an office and manufacturing building also in Dallas, heating and hot water; and in an office manufacturing building in Austin, heating and cooling.
- **Virginia:** In a hospital in Charlottesville, heating and hot water.
- **West Virginia:** In an educational and conference center for Bethany College in Bethany, heating and hot water.

New Deputy Director at KSC

Gerald D. Griffin, 43, until recently deputy director of NASA's Dryden Flight Research Center, has been reassigned to the Kennedy Space Center, as deputy director. He assumed the position in July, succeeding Miles Ross who resigned from NASA in May.

Before becoming deputy director of the Dryden center in 1976, Griffin served for three years at NASA headquarters, first an assistant administrator for legislative affairs and later as deputy associate administrator (operations) in the Office of Space Flight. At the Johnson Space Center, Griffin was a flight controller during the Gemini program, a flight director on all 11 Apollo missions and lead flight director on Apollo 12, 15 and 17.

Griffin has received numerous awards for his NASA service, among them two NASA Exceptional Service Medals for his work on Apollo 12 and 15, the Presidential Medal of Freedom Group Achievement Award for Apollo 13 and the NASA headquarters Creative Management Award.

Test Facility for Shuttle Completed

The converted Saturn test stand at the Marshall Space Flight Center will be used to conduct a series of structural tests with the Space Shuttle solid rocket booster beginning this December. The stand was used for static test firings of the first stages of the Saturn I and IB during the 1960s.

A "short-stack" booster (minus two center segments and approximately 18.3 meters (60 feet) shorter than flight boosters) will be used for the tests, with test loads that will simulate prelaunch, flight and recovery reactions.

The SRB will undergo structural influence, strain and deflection tests and will be filled with oil and pressurized for some tests. In addition, it will undergo life-cycle structural tests where it will be tested many times with loads to be experienced during the launch, liftoff/flight and recovery phases.

The overall objective of the test program is to verify that the structure and materials are adequate to withstand normal SRB functions.

The first deliveries of booster structural test hardware began July 1. The SRB test article will be assembled and tested by MSFC's test laboratory.

Two SRBs will be used for each Shuttle launch, simultaneously generating 11.79 million Newtons (2.65 million pounds) of thrust each at liftoff. At burnout, approximately 126 seconds after ignition, they will separate from the external tank and be parachuted into the ocean where they will be towed to shore, disassembled and refurbished. They are designed to be used for 20 Shuttle flights.

MSFC is responsible for the solid rocket booster, external tank and Space Shuttle main engine projects for the Shuttle program.

Pioneer 11 Crossed Jupiter's Orbit Again

NASA's Pioneer 11, bound for the outer reaches of the solar system, crossed the orbit of Jupiter for the second time last June 10. The first pass occurred in December 1974, when the spacecraft flew past the giant planet itself. Jupiter's enormous gravity then "kicked" the spacecraft into a new orbit that will take it to ringed Saturn in September 1979.

Pioneer 11 was aimed just ahead of and below Jupiter and the resulting kick flung Pioneer upward above the plane of the planetary orbits (the ecliptic plane) and inward, closer to the Sun.

By mid-1976, Pioneer had moved 200 million kilometers (130 million miles) closer to the Sun, was 160 million km (100 million mi.) above the outer edge of the asteroid belt and had started the outward part of its trip to Saturn. Pioneer now is two-thirds of the way on the 2.4 billion-km (1.5 billion-mi.) trip from Jupiter to Saturn.

After passing Saturn, Pioneer will head out of the solar system, traveling roughly in the same direction as the solar system moves through the galaxy. This is nearly opposite the path of Pioneer 10, Pioneer 11's predecessor, already on its way out of the solar system and now between the orbits of Saturn and Uranus.

The Pioneer encounter marked the first time the massive gravity of one of the huge outer planets was used to accelerate a spacecraft and place it on a path leading to a different planet. Voyager, to be launched this summer toward Jupiter and Saturn, also will make use of this gravity-assist maneuver.

Pioneer 11 has added greatly to our knowledge of Jupiter and the solar system. At Jupiter, Pioneer, in addition to getting important new data on the magnetic fields and radiation belts, took the first look at the planet's polar regions (not visible from Earth) and the first closeup pictures of two of the four large Jovian moons, Io and Europa. During 1976, when Pioneer 11 was high above the ecliptic plane, data were obtained that greatly improved our understanding of the structure of the Sun's magnetic field. That data will help us to better understand Sun-Earth relationships and their effects on climate. The new data are consistent with a less complicated internal structure for the Sun and Stars.

Each Pioneer carries a plaque with a message for any intelligent species that may intercept the spacecraft during its endless journey through the cosmos.

The Pioneer 10 and 11 projects are managed for NASA's Office of Space Science by Ames Research Center. The spacecraft were built by TRW Systems, Redondo Beach, Calif.

Viking Biology Instruments Turned Off

Viking's biology instruments have completed their search for life on Mars. Controllers at NASA's Jet Propulsion Laboratory commanded the biology instrument on Viking lander-2 to turn off May 30. The biology instruments aboard lander-1 began operating on July 28, 1976. Lander-2 began searching Martian soil samples last Sept. 11. Both have operated continuously since.

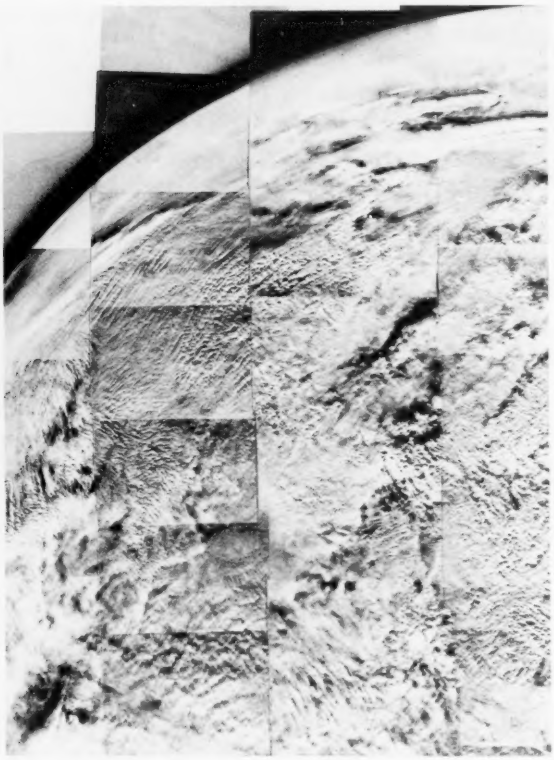
The instruments have consumed their high-pressure helium, nutrients and other consumables, and have

performed all experiments for which the instrument was designed and others that were not in the original plan.

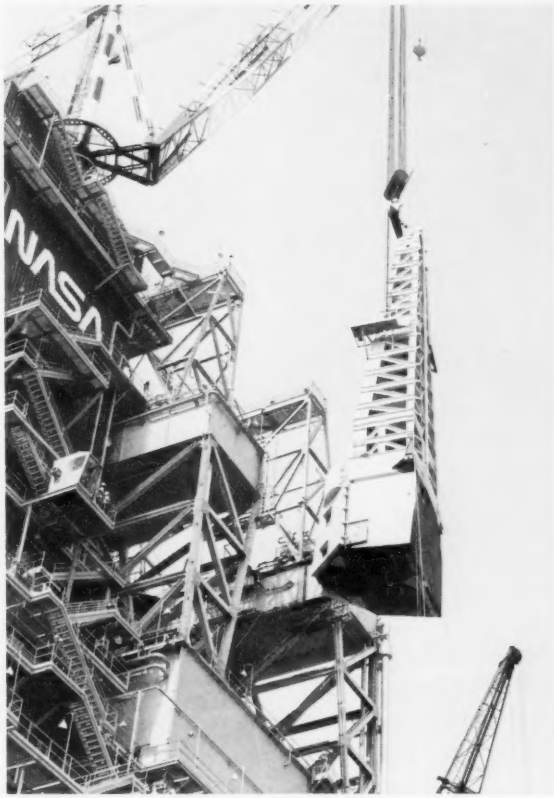
Both Viking landers continue to operate in a satisfactory manner. All experiments except biology and organic analysis are operating, though experiments on lander-2 have been reduced because of the winter cold. The Viking orbiters continue to operate normally.

Biologists have not reached any final conclusions about the presence or absence of life on Mars. They are continuing to study various combinations of soil and other chemicals in laboratories across the United States in an attempt to duplicate and understand results from the biology instruments on Mars.

Viking is operated for NASA's Office of Space Science by Langley Research Center. The mission is controlled from JPL, which is managed for NASA by the California Institute of Technology. G. Calvin Broome is mission director.



Huge Martian Dust Storm—On the first anniversary of Viking's landing on Mars (July 20), a raging dust storm covered all of the planet except the north and south poles. Had the same conditions prevailed last year, the Viking landing would not have been possible.



Enormous Space Shuttle Test Article Delivered to NSTL—A simulated Space Shuttle orbiter recently was delivered to NASA's NSTL installation in Mississippi. The steel structure was transported from the Michoud Assembly Facility at New Orleans after traveling from Seal Beach, Calif. (via the Panama Canal) on the NASA barge "Poseidon." The simulator will substitute for an orbiter on the test stand when firings of the main propulsion test article begin at NSTL late this year. The creation, here being lifted into position, about 29 meters long and weighing about 110,300 kilograms, was installed in its recently modified NSTL test stand one day after its arrival. The same test stand was used in early test stages of the Apollo/Saturn spacecraft. The first firing of the three Space Shuttle main engines is scheduled to take place at NSTL this coming December.

A MAN FOR THE AGES
Wernher von Braun
1912-1977

All too infrequently, the world has been blessed with men whose dreams are mighty and whose hands are skilled to bring those dreams to life. Such a man was Wernher von Braun, by choice an American, who possessed the genius both to dream and to give his dreams reality. Present and future generations are forever in his debt for the monumental contribution he made to space science. Because of him, our nation leads the world in the exploration of the Universe.

What lies in store for the sons and daughters of man beyond the shores of Earth, no one now living can surely say. What benefits to human life will be derived from space we are just beginning to learn. But one fact we know—the name of Wernher von Braun, the dreamer and the realist, will stand for posterity as one of a handful of humans who saw a bright future for humanity beyond the boundaries of Earth.

Robert A. Frosch

Life began for von Braun in Wirsitz, Germany (now part of Czechoslovakia). He was educated at the Berlin Institute of Technology, later at the University of Berlin where he received his Ph.D. in physics. He was part of the organization that developed the long-range ballistic missile known as the V-2 rocket. Von Braun came to the United States in 1945 and, with a group of fellow rocketry experts which had surrendered to American forces at the end of World War II, began high-altitude atmospheric research from New Mexico test sites. He is seen here with his father, Baron Magnus von Braun, in 1972.

Von Braun became director of NASA's (then) newly formed Marshall Space Flight Center at Huntsville in 1960, and thereafter was deeply involved in the development of the Saturn booster, which eventually resulted in the Apollo launches. Here, in another role, the adventurous von Braun begins lessons in underwater science with oceanographer Jacques Piccard in the neutral buoyancy tank at Marshall.

Just before the launch of the first unmanned boilerplate model of the Apollo spacecraft into Earth orbit (Saturn-Apollo 6), in 1964, von Braun watches the flight vehicle from a periscope inside the blockhouse at Cape Kennedy. The time was seven years after the Soviet launch of Sputniks 1 and 2, three years after the launch of a suborbital flight from the Marshall center in which Ham, a chimpanzee, was sent aloft during the early American Mercury program.

The beginning of perhaps the most exciting period in the early American space program came on May 28, 1964 when Saturn-Apollo 6 was launched from the Kennedy Space Center. Here a tense team of early U.S. NASA officials waits to see whether their efforts will result in a first successful orbital flight. Standing left to right are: Dr. George E. Mueller, associate administrator for Manned Space Flight; von Braun; Dr. Eberhard Rees, then deputy director at Marshall. In foreground is (then) Lt. Col. Rocco Petrone, chief of heavy vehicles at the Kennedy center (later he became Deputy Director at NASA headquarters).

The big moment brings an excited von Braun to his feet as a Saturn vehicle carried the Pegasus satellite into orbit less than a year later. Dr. Kurt Debus, then director of NASA's Kennedy center (and an early scientific colleague of von Braun in Germany), is seen seated just to von Braun's right).

Witty, ebullient and friendly in his social life (serious and businesslike during working hours), von Braun was a friend to presidents, kings, statesmen and fellow scientists the world over . . .

. . . he was not only a friend but a hero to his neighbors in Huntsville, Ala., seen here carrying him aloft to a speaker's platform after Apollo 11 landed on the Moon in 1969. In 1970, he became Deputy Associate Administrator at NASA headquarters. He left NASA in 1972 to work for private industry; later, in 1974, he founded the National Space Institute.

Von Braun, photographed in front of models of Saturn 5 and Skylab. In a poignant and prophetic question a few years later at the Kennedy center in 1975, he said: "Will you take my picture in front of the Saturn V? I may not be here again."

Goddard Education Personnel Win Praise

In appreciation for a three-week community involvement program conducted in December 1976 by the educational programs division of NASA's Goddard Space Flight Center, the president of the Board of Education of community school district 6 in New York City, presented Goddard with a plaque citing the center for its contribution to the education of children. District 6 encompasses schools in Manhattan with 16,000 students in the kindergarten through eight-grade levels. Present from the city for the presentation ceremony were: Louis Rivera, president of the school board; Dr. Leonard Strauss, school board member; James Roberts, deputy superintendent of schools, district 6; Mrs. Helen Thompson, representing the district's teaching staff; and Helton Paris, representing its administrative and supervisory staff.

In another ceremony, Elva Bailey, educational programs officer at the Goddard center, was honored by the board of education of Prince George's County, Md., at its recent annual awards ceremony. President of the board Jesse J. Warr, Jr., presented Bailey with a special award, entitled "Citation of the Year for Outstanding Community Service" (to the schools of the county). It was the first time such an award has been presented to a citizen not a member of the county's education staff.

Educational Advances Recognized—Dr. Edward J. Feeney, superintendent of Prince George's County Schools (Md.), at right, presents framed award to Elva Bailey (left) of the Goddard center. Jessie S. Warr, Jr., president of the Prince George's board of education, is in background.

New Autopilot for High-flying, Super-fast Planes

Engineers at NASA's Dryden Flight Research Center have developed an autopilot that will permit future high-speed, high-altitude aircraft to fly much closer on flight path. The autopilot was developed during flight tests of the 3,200 km/h (2,000 mph) YF-12 aircraft. NASA is flying the craft to aid in the development of technology for future high-speed aircraft.

Experience gained from the YF-12, XB-70 and other aircraft, which cruise at high speeds and altitudes, indicates that deviations from planned speeds and altitudes can be quite extreme. Altitude changes of plus or minus 1,200 m (4,000 ft.) and speed differences of over 48 km/h (30 mph) have been reported. Conventional aircraft autopilots use flight control surface movement to maintain speed or altitude, but that method will not work at the higher altitudes and speeds. When the aircraft cruises at Mach three (three times the speed of sound), the gradual temperature and pressure changes across the country seem to be rapid changes. Since Mach number is a function of temperature and pressure, this rapid change can result in Mach change. Using conventional techniques to correct for such changes can result in large altitude deviations and poor passenger ride qualities. These deviations also can result in loss of aircraft performance or exceeding the operating limits of the aircraft.

The YF-12 system combines both surface motion and throttle motion for control. Up to now, the two systems have not been used together at high speeds and altitudes. (Automatic throttle control is generally limited to lower speeds.)

On the YF-12, the two systems, along with newly developed data sensors, have functioned with great precision even at high speed cruise conditions over extended periods of time.

Two Spacelab Simulations Completed at NASA Centers

One Spacelab simulation ended recently at the Johnson Space Center while another—ASSESS II, described in the June *Activities*—at the Ames Research Center ended a few days later. At JSC, three life sciences specialists spent a week in a ground-based simulation, conducted at the bioengineering and test support facility.

Drs. William E. Thornton, Carter Alexander and Bill A. Williams lived aboard the high-fidelity mockup of the Spacelab and Shuttle orbiter crew deck throughout the week-long test.

Thornton, an astronaut-physician, was mission specialist. Alexander and Williams were payload specialists. Thornton and Alexander are from JSC; Williams is from the Ames center.

Spacelab is under development by a consortium of ten European nations and will be carried into space in Shuttle orbiter's payload bay. A wide range of scientific, medical and engineering experiments will be flown aboard each Spacelab mission.

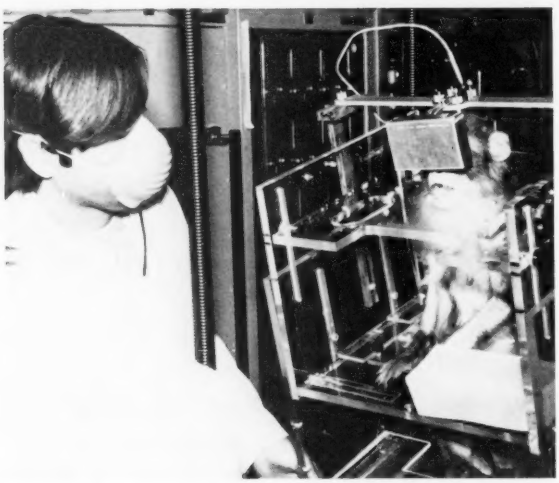
Spacelab life sciences payloads, similar to the developmental experiments in the week-long simulation, will be aimed toward determining the effects of the space environment on living organisms and improving space crew health care during future space exploration missions.

Additionally, the payloads will be used to develop life support systems for people living and working in space and applications of space technology toward clinical research and health care on Earth.

Medical monitoring and health services for the Spacelab Mission Development III crew were provided by Dr. Thornton.

A "rack" of 20 life sciences experiments was developed and built at Ames and shipped to Houston for the simulation. An additional six JSC experiments were run during the test. The crew also conducted human cardiovascular and respiration tests and measurement of tolerance to motion sickness.

Spacelab is one of the major payloads being developed to fly aboard Shuttle flights in the 1980s.



Biological Experiments for Spacelab—Dr. Bill A. Williams, payload specialist in the Spacelab mock-up at JSC, checks out a rhesus monkey used to measure electrically the activity of eye muscles during various tests of animal responses under simulated space conditions. The mask is worn to avoid cross contamination between crew members and experimental animals.

Sounding Rockets Now Have "Person-in-Loop" System

A new system of flight control for NASA sounding rockets has been developed which permits improved accuracy in the aiming of instruments in astronomical and other scientific studies. Use of the new system already has resulted in a major astronomical find related to quasars—those celestial objects believed to be the most remote in the universe.

The latest improvement by engineers at the Goddard Space Flight Center places a person in the loop by means of a small television camera in the sounding rocket's nose cone. The operator on the ground watches the image coming from the rocket and operates his controls (remotely triggering the on-board attitude control system) for more precise directing toward a stellar objective.

The technique is a modification of the STRAP (for Stellar Tracking Rocket Attitude Positioning) apparatus developed some years earlier at the Goddard center for keeping a payload aimed at a given target during a rocket's upward and downward flight above the atmosphere, which was used successfully on more than 100 flights. This involved a "star tracker" or sensor, which usually observed a prominent guide star from the front or side of a payload. The emission from the star automatically controlled a gas-actuated system for stable targeting of the payload's telescope.

Under the old STRAP arrangement, the sensor looked out through an aperture with a diameter of about two minutes of arc. The TV-and-operator improvement will permit the use of an aperture of only about 20 or 30 seconds of arc, thereby eliminating much more background interference.

The first scientific use of the new manned system took place at the White Sands Missile Range in New Mexico last April. Johns Hopkins University scientists succeeded in obtaining the first observation ever made of a quasar in the ultraviolet region of the spectrum. (A quasar, or quasi-stellar object, is a celestial source that looks like a star but probably is a galaxy.) The observed quasar is three billion light years from Earth. It is the faintest and most remote object ever observed from above the Earth's atmosphere.

The project was headed by Dr. Arthur Davidsen of Johns Hopkins' Department of Physics (Baltimore, Md.), who operated the controls while watching the TV screen. His colleagues were Professors William G. Fastie and George Hartig. The Black Brant sounding rocket and other support were provided by the Goddard center. The experiment was a critical link in enabling astronomers to assess the nature and importance of quasars.

The innovation, along with another recent development, the reusable sounding rocket, will enable many more researchers to conduct observations above the Earth's obscuring atmosphere. The improved systems also will be able to make better use of sounding rockets as research tool for reaching areas now inaccessible to orbiting spacecraft, balloons or aircraft.

Artist's concept of the recently discovered "disc-star."

Planetary Evolution May Be in View

Discovery of a "disc-star," which may be in the process of forming its own planets, has been made by a University of Arizona-NASA Ames Research Center team. The find is remarkable in that it may mark the first detection of a planetary system in formative stages.

The flat, disc-shaped, highly luminous star (MWC 349), in the constellation Cygnus, is estimated to be only 1,000 years old. Its surrounding disc of intensely glowing gas appears to have a diameter 20 times that of the central star, and to be emitting about 10 times as much light as the star itself. The disc at its outer edge is calculated to be about as thick as the star's diameter. Total brightness of the new stellar object appears to be declining about one percent a month as luminous material from the glowing disc spirals into the central star. Hence, the luminous disc is expected to be gone in about 100 years.

The new star is about 10 times the size and 30 times the mass of our Sun, and is expected to live only 100 million years, or about 1/100th as long as our Sun, whose calculated life is 10 billion years.

The discovery was made by a team of astrophysicists headed by Dr. Rodger Thompson of the Steward Observatory at the University of Arizona. Team members were: Dr. Peter Strittmatter, Steward's director and Drs. Edwin Erickson, Fred Witteborn, and D. W. Strecker, all of NASA's Ames center.

Observations of the star were made with the 91-cm infrared telescope of Ames' Kuiper Airborne Observatory (the largest in existence) and the Steward 2.3-m infrared telescope. The Kuiper airborne telescope "saw" the large portions of the infrared spectrum which do not penetrate the atmosphere and cannot be seen from Earth; the larger Steward telescope had better resolution. Together they made possible the discovery. Infrared observations were essential to enable viewing through the veil of dust that shrouded the disc star.

The scientific team believes the significance of the find lies in the fact that planets may well be forming now in the luminous disc or may have just formed in the gas outside the luminous disc of the star. Characteristics of this rapidly changing disc should shed light on planet-formation processes in our solar system, and around other suns. At present, scientists have no satisfactory model to explain the formation of planets around suns. Existing theories are that stars form from rotating clouds of hydrogen and other elements which contract because of gravity. The rotation produces a flat, spinning disc. Material in the disc is then believed to move toward the center, eventually piling up enough mass to ignite the nuclear fusion reaction that produces starlight. But the mechanics of the process of planet formation are not understood. Now, watching MWC 349, astronomers believe they may be observing the evolution of a planet.

Two Tons 12 Miles High

An aircraft which is among the most sophisticated high-altitude scientific platforms in the free world presently is being flown by NASA's Johnson Space Center. The plane is a long wing version of the Air Force Canberra and is officially designated a WB-57F. The WB-57F can carry an 1,800-kilogram payload above 18,000 meters and has a range of 4,630 kilometers with a six-and-a-half hour endurance. This is roughly equal to hauling a standard sized automobile from Miami to Seattle at an altitude of 19 km.

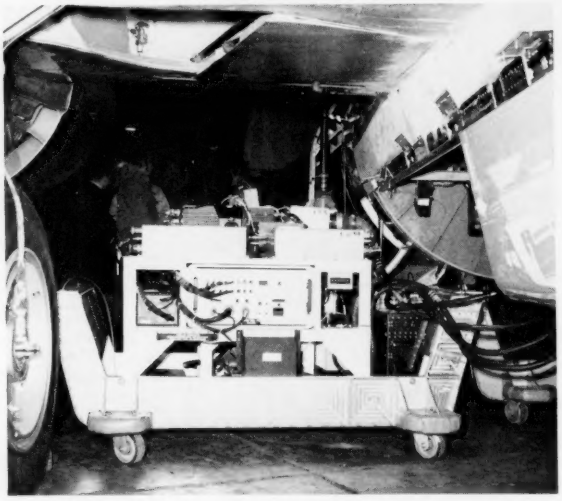
The Johnson center recently completed a major modification to the Earth survey plane, which provides multi-mission capability with minimum out-of-service time for sensor payload change. This is achieved by having interchangeable sensor pallets with standardized power and control connections. The pallets are 1.5 m wide, .6 m deep and come in lengths of about 1 to 1¾ m. Any combination of pallets which totals nearly 4 m of pallet length can be flown. Empty pallets are installed if the full sensor pallet capacity is not required.

When a project or experiment is approved for flight on the WB-57F, one of the empty interchangeable pallets is provided to the investigator who installs the flight equipment in the pallet at his facility. Standardized engineering procedures and electronics connections are specified to insure compatibility and safety. The integrated pallet with its cockpit control panel is returned to the Johnson center, installed and flown on the craft. Since the pallets, connections and control panels are interchangeable, the complete sensor complement and mission literally can be changed overnight.

In addition to its 1,800 kg palletized payload

Fancy Photo Equipment—Nine cameras can be operated simultaneously or independently in this pallet, ready to be placed aboard the WB-57F.

Unique Aircraft Being Equipped for Air Turbulence Study—At the Langley center, the MAT system was installed aboard the WB-57F, an earth survey aircraft developed at the Johnson center. The reconfigured nose is part of the MAT system, and MAT electronics are contained in another pallet aboard the plane.



Sophisticated Scanner.—The RS-18 five-channel scanner, flown aboard the WB-57F craft, is mounted in a pallet measuring about one meter.

capability, the plane carries sophisticated data support systems. A data annotation system formats the data, flight parameters and inertial guidance information for two 14-track tape recorders. The scientific equipment operator in the back cockpit operates the inertial and omega navigation systems and controls and monitors all sensor and data support systems, a factor that frees the pilot from extra duties.

NASA's Langley Research Center was the first organization outside JSC to take advantage of the capability of the WB-57F. Their measurement of atmospheric turbulence (MAT) system pallet was ready for installation when the aircraft modification was completed in late January. The MAT system is a piggy-back type of investigation that collects data on clear air turbulence while the aircraft is used for other missions. Several successful MAT data flights so far have been completed. The MAT system will be replaced with side-scanning radar in the fall of 1977. NASA's Goddard Space Flight Center is installing sensors in two other pallets for weather and cloud studies.

JSC has a photographic pallet and a five-channel scanner pallet in operation. Both pallets and the MAT pallet are being flown simultaneously. The total capability of this configuration is impressive—two metric cameras, six multispectral and one high-resolution camera, a five-channel scanner covering thermal and visible channels and the MAT system. All can be operated simultaneously or independently.

NASA's JSC operates two versions of the new craft. The second one is under contract to the Energy Research and Development Administration for the collection of high-altitude air samples and data. Recently it was used to collect samples of the Chinese nuclear explosion debris and it has collected much of the data used to determine ozone-layer deterioration. It has carried as many as eight sensor/sampler systems while in operation by JSC and has the capability for several more in simultaneous use.

Marshall Man Receives Sloan Fellowship

John P. McCarty, a Marshall center engineer and a graduate of the Massachusetts Institute of Technology recently was selected by Stanford University as a Sloan Fellow for the 1977-78 academic year.

McCarty, assistant chief engineer for the Space Shuttle main engine office, was one of two NASA employees nominated by NASA's office of professional development for the Stanford-Albert P. Sloan Fellowship Program.

Visual Communications Seminar

NASA's Office of Public Affairs at headquarters, sponsored a seminar on the unified visual communications system in June at which the primary subjects under discussion were design effectiveness in solving visual communication problems and the development of solutions necessary to achieve greater economy, efficiency and better communications for the agency.

Seven NASA field centers presented a graphics improvement progress report, discussing problem areas and offering individual recommendations. A problem-solving workshop, which provided an opportunity for an exchange of ideas and information, was part of the program.

Among program participants were Herbert J. Rowe, NASA's Associate Administrator for External Affairs, and Public Affairs chief Robert A. Newman.

Virginia College Students Win Awards.—Robin Walker (seated) and Reginald Clark (right), students at Norfolk State College respectively won first and third place awards for technical papers presented at the National Institute of Science Convention held in Nashville, Tenn. in April. Walker's paper is entitled "Revision of the Simplex Method for Solving Linear Programs"; Clark's paper is entitled "Solution by Matrix Exponential Method." Both were derived from work performed on a grant to Norfolk State College for "Research in Numerical Mathematics" sponsored by NASA's Langley Research Center. Moses Boseman (center), professor of mathematics, is the principal investigator on the grant.

NASA Author Levy Elected to National Office

NASA journalist Lillian Levy is the newly elected president of the American Newspaper Women's Club.

Her election as president of the American Newspaper Women's Club for the 1977-78 year makes her the 29th president of this distinguished organization which celebrates its 45th year as a leading professional newspaper association in the Nation's Capital.

Also elected to office were: freelance writer Marj Skinker, first vice president; Barbara Kober of the Washington Star, second vice president; and Mary Ann Guyol, recording secretary; Alice Fryer, corresponding secretary; Pam Ginsbach, treasurer; Nadine Pitts, Historian.

Elected to the board of governors are Helen Dudman of WETA-TV; Peggy Whedon, producer of ABC's "Issues and Answers" and Goody Solomon, consumer reporter.

For several years, Levy wrote the NASA column "Down to Earth—A Women's View of Space."

Currently, she is liaison for NASA to a variety of organizations including women's groups, health and medical associations, and public affairs organizations.

In June, Levy planned and coordinated the program for the National Federation of Press Women attended by 300 presswomen at NASA's National Space and Technology Laboratories in Mississippi.

She is the author of *Space: Its Impact on Man and Society* published by W.W. Norton in 1965, and reissued last year by Books for Libraries, Inc. Levy is a recipient of NASA's Sustained Superior Performance Award.

Groo Leaves NASA

NASA's Associate Administrator for Center Operations, E. S. Groo, departed from the agency in late July. He joined NASA in September 1974. Ray Kline, former assistant administrator for institutional management, is serving as Acting Associate Administrator for Center Operations.

Dr. Alan M. Lovelace, NASA Deputy Administrator, lauded Groo for his "substantial contributions to agency amangement." Lovelace said Groo's role in clarifying the roles and missions of the field centers has been of particular importance, adding that: "The successful accomplishment of this effort has strengthened the individual missions of the centers, laying the foundation for planning NASA's future programs. In like manner, his initiation of efforts to train and develop future agency managers is an important step in providing the individuals and talents needed to accomplish these programs."

Before coming to NASA, Groo was with the International Business Machines Corp. He retired in 1973 from IBM as vice president of the World Trade Corp., a position he had held since 1959.

A native of Philadelphia, Groo is a graduate of Drexel University. He served in the U. S. Navy during World War II.

NASA Employee Is Regional Director of IMAGE

Dora Borjon, a staffing clerk in the personnel office at NASA's Dryden Flight Research Center recently was elected regional director of IMAGE, a non-profit organization designed and set up to promote Hispanic employment.

Borjon serves on the national board of IMAGE with nine other regional directors elected throughout the United States. She represents California, Nevada and Arizona.

The national president of IMAGE also appointed her to serve on the women's committee which deals specifically with problems confronting the Hispanic woman on job markets in the western U.S.

Borjon is the Spanish-speaking program coordinator at Dryden. Her duties include developing, implementing and coordinating the Spanish-speaking program, and helping with recruitment of students at colleges with large Spanish-speaking enrollments.

Among her awards was the Spanish-speaking program coordinator award in 1976, and the NASA community service award for her work on the Equal Opportunity Committee at the Dryden center.

Did You Know?

Dr. Roger E. Bilstein of the University of Houston, has won a grant from the National Air and Space Museum of the Smithsonian Institution to spend a year at the museum, researching and writing a survey of American aviation and astronautics. Bilstein wrote the official NASA history of the Apollo/Saturn launch vehicles.

Frank Zblewski of the Defense Nuclear Agency in Washington, D.C., was the winner in the logo contest held recently by the Federal Women's Program. His was one of more than 1,400 entries received from around the world. The logo is in black and white uncapitalized letters in a modernistic design.

Two satellites in the Cosmos series were launched by the Soviet Union in early June. The satellites were the 913th and 914th in the series. Both were functioning normally at last report.

Sunday drive-through tours of the Kennedy Space Center, suspended more than a year ago because of bicentennial construction, resumed recently. Visitors can enter the center from State Road 3 on Merritt Island or from State Road 405 off U.S. 1. Gates stay open from 9 a.m. to 3 p.m. every Sunday.

A total of 119 proposals for materials processing experiments to be performed on flights of Space Shuttle and Spacelab have been received from researchers by Marshall center personnel. The proposals, in response to an announcement issued several weeks ago by NASA's Office of Applications, include applied and basic research projects in branches of materials science where weightlessness and ultra-high vacuum obtainable in orbital flight can be exploited to unique advantage.

Contractor News

The Lockheed Aircraft Corp. of Burbank, Calif., has been awarded a $104,300 cost-plus-fixed-fee contract by NASA's Dryden center to provide an L-1011 wide-body, tri-jet aircraft for seven months. About 10 one-hour flights are planned. The L-1011 will be equipped with eight smoke generators that will be used to mark the vortices inflight.

Rockwell Intl.'s Rocketdyne Division of Canoga Park, Calif., has won a supplemental agreement to an existing contract to provide welding equipment needed in the Space Shuttle Main engine program. The supplement of $1,287,899 was issued by NASA's Marshall center for the purchase and installation of a new electron beam welder to support fabrication of the main engines.

Boeing Services Intl., Inc., of Seattle, a wholly owned subsidiary of Boeing Aerospace Corp., has been selected by NASA for final negotiations leading to the award of a cost-plus-award-fee contract to provide ground systems operations in support of NASA launch operations under Kennedy center management. Services, which were begun last July 1, consist primarily of the operation and maintenance of launch systems and facilities. The contractor's estimate of the contract value for the first three years, including the maximum award fee, is about $80,500,000.

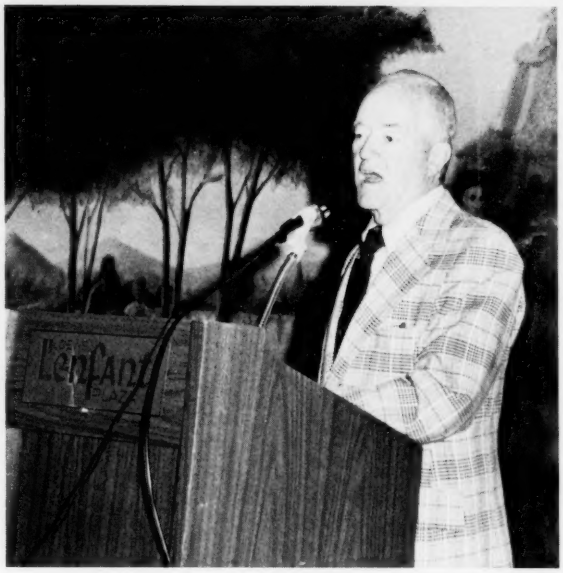
Rockwell Intl. Corp. Space Division of Downey, Calif., is the recipient of a supplemental agreement to a contract with the Johnson center covering engineering changes in the Space Shuttle orbiter. The $1.1 million addition includes 10 changes in the orbiter flight control system and relocation of the remote manipulator system. The supplemental agreement brings to $3,052,386,391 the cost-plus-award-fee contract.

The Boeing Commercial Airplane Co., of Seattle was awarded a $1.7 million NASA contract to investigate selected advance aerodynamic and active controls technology concepts for use on a Boeing 747 civil transport aircraft. Costs of the contract will be shared, with the government contributing about $1.7 million and the contractor about $200,000. Managed by NASA's Langley Research Center, the work will be performed over a two-year period at the Seattle plant.

NASA Publications

"Skylab, Our First Space Station" (NASA SP-400) is the first in a series of books to be issued by the scientific and technical information office in recognition of the historic U.S. Skylab mission. The abundantly illustrated, 180-page book provides a general introduction and overview of the Skylab mission, its problems and its triumphs. Later volumes will deal with detailed results of the scientific experiments and other facets of the Skylab mission, in which numerous manned space records were set. The first volume is for sale for $7.00 by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Stock number is 033-000-00670-5.

Meals for the Aged Discussed—Senator Hubert H. Humphrey presented the keynote address at a NASA-sponsored national conference on meals for the elderly held recently in Washington. The conference featured results of research carried out at NASA's Johnson Space Center and the Lyndon B. Johnson School of Public Affairs, which centered on how to keep nutritious foods fresh for long periods without refrigeration. Such provisions, whose use stems from the specially processed meals consumed by astronauts in the space program, are being developed for delivery to elderly people who find it difficult to obtain or prepare healthy, balanced meals. Participants in the conference were the Administration on Aging (HEW), the Department of Agriculture, the State of Texas and representatives of the food industry.



Patents for Inventions from NASA Research

The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel of the indicated installation.

Inventor(s) and Employer(s)	Title & NASA Docket	Patent No.	Installation
George F. Smoot, William L. Pope, and Lawrence Smith, Univ. of Calif., Berkeley	Low gravity phase separator	4,027,494	JSC
Richard R. Corwin, Joseph S. Kramer, Beta Industries, Inc., Dayton, Ohio Theodore R. Creel, Jr., NASA/LARC Robert A. Jones, NASA/LARC	Apparatus for determining thermophysical properties of test specimens	4,027,524	LaRC
Dan H. Dane, NASA/MSFC	Oscillating vane engine	4,029,060	MSFC
Biliyar N. Bhat, National Research Council, Washington, DC	Method of growing composites of the type exhibiting the soret effect	4,029,500	MSFC
Dah Yu Cheng, Univ. of Santa Clara Santa Clara, Calif.	System for measuring three fluctuating velocity components in a turbulently flowing fluid	4,028,939	ARC
Francis E. Goodwin, Hughes Aircraft Company, Los Angeles, Calif.	Opto-mechanical subsystem with temperature compensation through isothermal design	4,030,047	GSFC
John Dimeff, NASA/ARC	Self-calibrating radiometer	4,030,362	ARC
Gary R. Russell, Che Jen Chen, and Kenneth G. Harstad, Caltech/JPL Pasadena, Calif.	Isotope separation using metallic vapor lasers	4,031,389	NRLO
George E. Fitzer, Caltech/JPL Pasadena, Calif.	Machine for use in monitoring fatigue life for a plurality of elastomeric specimens	4,030,348	NRLO
Jack A. Kinzler, James T. Heffernan, Leroy G. Fehrenkamp and William S. Lee, NASA/JSC	Surface finishing	4,032,089	JSC
Judd R. Wilkins, Stacey M. Mills, NASA/LaRC	Automated Single-slide staining device	4,029,470	LaRC
Christos C. Chamis Raymond F. Lark, NASA/LeRC	Hybrid Composite Laminate structures	4,029,838	LeRC

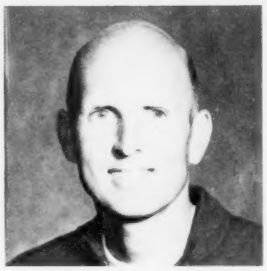
Launches for 1977—Completed and Projected

Name	Launch Date	Vehicle	Range	Mission Remarks
NATO-3 B	Jan. 27	Delta	ETR	Second communications satellite in synchronous orbit to perform communications relay for NATO. Reimbursable.
Palapa-2	March 10	Delta	ETR	Back-up satellite for Indonesian domestic communications network. Reimbursable.
GEOS/ESA	April 20	Delta	ETR	ESA spacecraft to conduct scientific investigation of waves and particles in magnetosphere. Reimbursable. Failed to reach correct orbit.
GOES/NOAA	June 16	Delta	ETR	Second operational satellite to provide continuous daytime and nighttime global cloud cover observations for NOAA. Reimbursable.
GMS-Japan	July 14	Delta	ETR	Geosynchronous Meteorological Satellite. Japanese portion of global network of geostationary environmental satellites. Reimbursable.
HEAO-A	Aug. 12	Atlas/Cen.	ETR	High Energy Astronomical Observatory to study energetic radiation from space.
SIRIO-I	Aug. 18	Delta	ETR	Italian project to investigate radio propagation, trapped radiation flux, magnetic field intensity and variation, and the primary electron energy spectrum. Reimbursable.
Voyager 2	Aug. 20	Titan III Centaur	ETR	Jupiter and Saturn planetary systems and the interplanetary medium out to Saturn.
Voyager 1	Sept. 1	Titan III	ETR	Same as above.
Intelsat IVA-C	Sept. 8	Atlas/Cen.	ETR	High Energy Astronomical Observatory to study energetic radiation from space.
OTS/ESA	Sept. 8	Delta	ETR	Orbital Test Satellite. ESA experimental communications satellite. Reimbursable.
Navy Transit	Sept 27	Scout	WTR	Navy navigation satellite. Reimbursable.
Landsat-C	Sept.	Delta	WTR	Third Earth resources technology satellite.
RCA-C	Sept.	Delta	ETR	Third domestic communications satellite for RCA. Reimbursable.
Meteosat	Sept.	Delta	ETR	ESA meteorological satellite. Reimbursable.

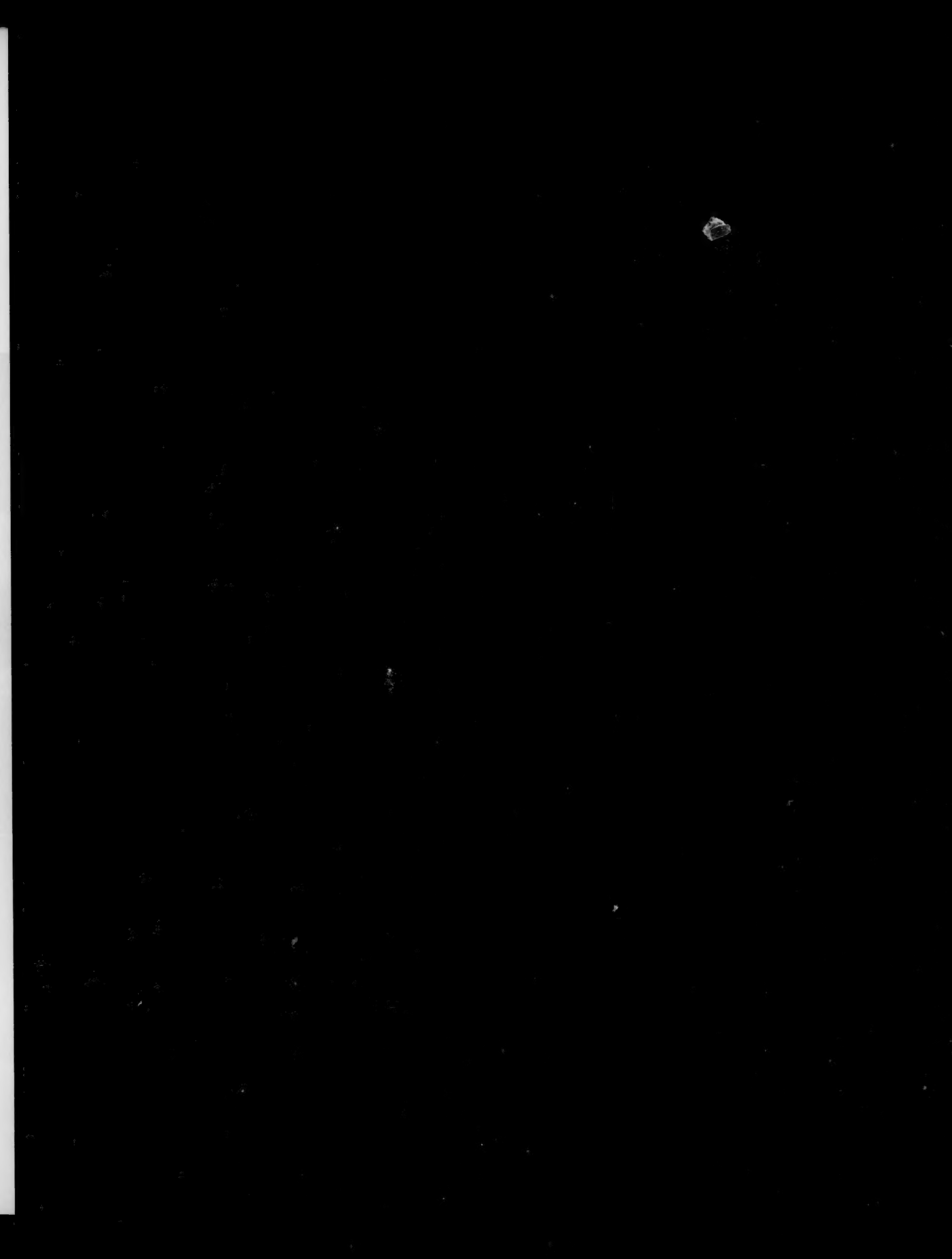
Space Technology Advances Explained—Herbert J. Rowe, (left) NASA's Associate Administrator for External Affairs, delivered the keynote address at a recent symposium held at the Marshall center to familiarize industry with engineering and productivity advances derived from space techology. Marshall's deputy director, Richard G. Smith (center) welcomed the attendees, and Aubrey Smith (right), director of the technology utilization office at the center, served as general chairman. The event was sponsored by the Marshall center and the Huntsville chapter of the Alabama Society of Professional Engineers.

Four of the Airmen Who Helped Make the Dream Come True

Fred W. Haise, Jr.
Enterprise *commander*



C. Gordon Fullerton
Enterprise *co-pilot*

Thomas C. McMurtry
Boeing 747 pilot

Fitzhugh L. Fulton, Jr.
Boeing 747 pilot